

### **REMARKS**

Claims 1, 3-18, 20, 22, and 25 are pending and under consideration. Claims 1, 17, 18, 20, 22, and 25 have been amended. Support for the amendments to the claims may be found in the claims as originally filed. This amendment is believed to place the application in condition for allowance, and entry therefore is respectfully requested. In the alternative, entry of this amendment is requested as placing the application in better condition for appeal by, at least, reducing the number of issues outstanding. Further reconsideration is requested based on the foregoing amendment and the following remarks.

#### **Response to Arguments:**

The Applicants appreciate the consideration given to their arguments. The Applicants, however, are disappointed that their arguments were not found to be persuasive.

In their remarks filed May 8, 2008, the Applicants argued that the claimed invention differs from Bigo in that the signal lights of each optical sender are filtered to approach a spectrum efficiency that maximizes a product of a transmission distance and a transmission capacity of the system, and that the signal light is an "NRZ" modulation type. Neither Bigo nor Miyamoto, in contrast, describe "maximizing a product of a transmission distance and a transmission capacity of the system," which results, in part, from "the type of modulation of said signal light is an NRZ modulation type," as recited in, for example, claim 1.

The final Office Action asserts in section 9, at page 7, that:

The Examiner disagrees. Bigo teaches on page 363 first col., first paragraph to use 0.6 nm filter for NRZ and 0.65 nm for RZ format. That is, using NRZ gives better spectrum efficiency.

Bigo, to the contrary, only describes a specific example in which a 3 dB-bandwidth of a branching filter in the receiving side is optimized at a value that minimizes cross-talk. In particular, as described in at the end of the first paragraph in the first column in section 2, at page 363 of Bigo:

The 3 dB-bandwidth of the demultiplexing optical filter was optimized in back-to-back so as to minimize cross-talk, at 0.6 nm for NRZ format and 0.65 nm for RZ format.

From this description, it can be understood that "minimizing the crosstalk" about each of NRZ and RZ can be achieved by filtering at the time of branching at the receiving side. This

description, however, does not indicate "using NRZ gives better spectrum efficiency," contrary to the assertion in the final Office Action, let alone "wherein the type of modulation of said signal light is an NRZ modulation type," as recited in, for example, claim 1. Bigo, consequently, is not "maximizing a product of a transmission distance and a transmission capacity of the system," as recited in, for example, claim 1.

Bigo, in particular, *evaluates* both formats, the RZ and the NRZ, as described in section 2, in the third full paragraph of the first column at page 363, without settling on one or the other. According to Bigo, in fact, the NRZ and the RZ formats turn out to have almost the *same* average sensitivity, as described in section 2 in the first paragraph of the second column of at page 363.

The technical point indicated in Bigo is actually at the end of the second paragraph in the second column at page 363, in section 2:

With narrow filters at Tx, RZ recovers in WDM the advantage over NRZ it has when a single channel is transmitted.

Bigo describes the RZ format as recovering the better sensitivity performance over the NRZ seen in single-channel mode, rather than describing "the type of modulation of said signal light is an NRZ modulation type," as recited in, for example, claim 1. That is, Bigo describes using RZ to perform filtering as effective on the sending side as well as on the receiving side, rather than describing that "the type of modulation of said signal light is an NRZ modulation type," which allows "maximizing a product of a transmission distance and a transmission capacity of the system," as recited in, for example, claim 1. Further reconsideration is thus requested.

#### **Claim Rejections - 35 U.S.C. § 103:**

Claims 1 and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bigo et al., "Improving Spectral Efficiency by Ultra-Narrow Optical Filtering to Achieve MultiTerabit/s Capacities", OFC 2002, 17-22 March 2002 (hereinafter "Bigo") in view of U.S. Patent No. 6,865,348 to Miyamoto et al. (hereinafter "Miyamoto"). The rejection is traversed. Reconsideration is earnestly solicited.

Claim 1 recites:

Maximizing a product of a transmission distance and a transmission capacity of

the system.

Neither Bigo nor Miyamoto teaches, discloses, or suggests "maximizing a product of a transmission distance and a transmission capacity of the system," as recited in claim 1. The final Office Action, in fact, does not even assert that Bigo *does* show "maximizing a product of a transmission distance and a transmission capacity of the system," as recited in claim 1.

Miyamoto is not "maximizing a product of a transmission distance and a transmission capacity of the system" either, and thus cannot make up for the deficiencies of Bigo with respect to claim 1. Thus, even if Bigo and Miyamoto were combined as proposed in the final Office Action, claim 1 would not result.

Claim 1 recites further:

Wherein the type of modulation of said signal light is an NRZ modulation type.

Neither Bigo nor Miyamoto teaches, discloses, or suggests "wherein the type of modulation of said signal light is an NRZ modulation type," as recited in claim 1. Bigo, rather, relates to a WDM transmission system that has centered optical filters on each channel before wavelength multiplexing at the Tx end. Bigo uses the WDM transmission system for simulating channels using either Non-Return-to-Zero (NRZ) or Return-to-Zero (RZ) formats. Bigo states that strong filtering at Tx has benefits for *both* formats in back-to-back, but the RZ format recovers the *better sensitivity performance over NRZ* seen in single-channel mode, in the last paragraph of section 2, at column 2, page 363. After transmission, strong filtering at Tx is also found to reduce transmission impairments, *but only for RZ format*. This is to be contrasted with claim 1, in which the "signal light is an NRZ modulation type."

Bigo states further that the Tx optical filtering applied to RZ format not only reduces channel linear crosstalk (Fig. 1), and thus improves the back-to-back performance, but also improves the transmission quality, whereas *it only slightly reduces linear cross-talk for NRZ*, in the last paragraph of section 2, at column 2, page 363. With narrow filters at Tx, RZ recovers in WDM the *advantage over NRZ* it has when a single channel is transmitted, in the last paragraph of section 2, at column 2, page 363. This is to be contrasted with claim 1, in which the "signal light is an NRZ modulation type."

Bigo teaches that the spectrum efficiency *is substantial for the RZ format but is minimal in relation to the NRZ format*. This is to be contrasted with claim 1, in which the "signal light is an NRZ modulation type."

Miyamoto, for its part, relates to a system that includes generating a partial response signal by converting a binary NRZ signal from a digital signal source, modulating the optical pulse signal passed on the partial response signal, and *outputting a binary RZ modulated signal*. In particular, as described in the Abstract:

The operation includes receiving a clock signal from a system clock source; modulating a single mode optical signal based on the clock signal and generating an optical pulse signal having two longitudinal modes, the frequency interval thereof being  $n \times B$ ,  $n$  being a natural number and  $B$  being a transmission speed; generating a partial response signal by converting a binary NRZ signal from a digital signal source in synchronism with the system clock source; and modulating the optical pulse signal based on the partial response signal, and outputting a binary RZ modulated signal.

Since Miyamoto is outputting a binary RZ modulated signal, Miyamoto does not show "wherein the type of modulation of said signal light is an NRZ modulation type," as recited in claim 1.

Claim 1 recites:

$$T(f) = 10 \cdot \log \left[ \exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left( \frac{|f - f_c|}{\Delta f/2} \right)^{2n} \right\} \right] \quad (\text{dB})$$

Neither Bigo nor Miyamoto teaches, discloses, or suggests

$$"T(f) = 10 \cdot \log \left[ \exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left( \frac{|f - f_c|}{\Delta f/2} \right)^{2n} \right\} \right] \quad (\text{dB})," \text{ as recited in claim 1.}$$

The final Office Action acknowledges this deficiency with respect to Bigo in section 2, at page 2, and seeks to compensate for it by combining Bigo with Miyamoto. As described at column 30, lines 53 and 54 of Miyamoto, however, the transmission characteristics of the super Gaussian filter shown in Miyamoto are indicated by:

$$T(f) = T_0 \exp \left\{ -(\ln 2) \cdot (2f/B)^{2m} \right\}$$

Thus, even if Bigo and Miyamoto were combined as proposed in the final Office Action, claim 1 would not result. Claim 1 is submitted to be allowable. Withdrawal of the rejection of claim 1 is earnestly solicited.

Claim 17:

Claim 17 recites:

Wherein the type modulation of said signal light is an NRZ modulation type.

Neither Bigo nor Miyamoto teaches, discloses, or suggests "wherein the type modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claim 1.

Claim 17 recites further:

A product of a transmission distance and a transmission capacity becomes maximum.

Neither Bigo nor Miyamoto teaches, discloses, or suggests "a product of a transmission distance and a transmission capacity becomes maximum," as discussed above with respect to the rejection of claim 1.

Claim 17 recites:

$$T(f) = 10 \cdot \log \left[ \exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left( \frac{|f - f_c|}{\Delta f / 2} \right)^{2n} \right\} \right] \quad (\text{dB})$$

neither Bigo nor Miyamoto teaches, discloses, or suggests

" $T(f) = 10 \cdot \log \left[ \exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left( \frac{|f - f_c|}{\Delta f / 2} \right)^{2n} \right\} \right] \quad (\text{dB})$ ," as discussed above with respect to the rejection of claim 1. Thus, even if Bigo and Miyamoto were combined as proposed in the final Office Action, claim 17 would not result. Claim 17 is the submitted to be allowable, for at least those reasons discussed above with respect to the rejection of claim 1. Withdrawal of the rejection of claim 17 is earnestly solicited.

Claims 3-12:

Claims 3-12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bigo and Miyamoto in view of U.S. Patent No. 6,496,297 to Frankel et al. (hereinafter "Frankel"). The rejection is traversed. Reconsideration is earnestly solicited.

Claims 3-12 depend from claim 1 and add additional distinguishing elements. Neither Bigo nor Miyamoto teaches, discloses, or suggests "maximizing a product of a transmission distance and a transmission capacity of the system," or "wherein the type of modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claim 1. Frankel does not either, and thus cannot make up for the deficiencies of either Bigo or Miyamoto with respect to any of claims 3-12. Thus, even if Bigo, Miyamoto, and Frankel were combined as proposed in the final Office Action, claims 3-12 would not result. Claims 3-12 are thus also submitted to be allowable. Withdrawal of the rejection of claims 3-12 is earnestly solicited.

Claim 13:

Claim 13 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Bigo and Miyamoto in view of Ramaswami et al., "Optical Networks", second Edition by Ramaswami et al., Academic Press, 2002, Published 12 October 2001 pp. 139-143 (hereinafter "Ramaswami"). The rejection is traversed. Reconsideration is earnestly solicited.

Claim 13 depends from claim 1 and adds additional distinguishing elements. Neither Bigo nor Miyamoto teaches, discloses, or suggests "maximizing a product of a transmission distance and a transmission capacity of the system," or "wherein the type of modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claim 1. Ramaswami does not either, and thus cannot make up for the deficiencies of either Bigo or Miyamoto with respect to claim 13. Thus, even if Bigo, Miyamoto, and Ramaswami were combined as proposed in the final Office Action, claim 13 would not result. Claim 13 is thus also submitted to be allowable. Withdrawal of the rejection of claim 13 is earnestly solicited.

Claim 14:

Claim 14 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Bigo, Miyamoto and Frankel in view of Ramaswami. The rejection is traversed. Reconsideration is earnestly solicited.

Claim 14 depends from claim 1 and adds additional distinguishing elements. Neither Bigo, Miyamoto, Frankel, nor Ramaswami teaches, discloses, or suggests "maximizing a product of a transmission distance and a transmission capacity of the system," or "wherein the type of modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claims 1 and 13. Thus, even if Bigo, Miyamoto, Frankel, and Ramaswami were combined as proposed in the final Office Action, claim 14 would not result. Claim 14 is thus also submitted to be allowable. Withdrawal of the rejection of claim 14 is earnestly solicited.

Claim 15:

Claim 15 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Bigo, Miyamoto, and Frankel in view of U.S. Patent Application Publication No. 2002/0025111 to Koshi et al. (hereinafter "Koshi"). The rejection is traversed. Reconsideration is earnestly solicited.

Claim 15 depends from claim 1 and adds additional distinguishing elements. Neither Bigo, Miyamoto, nor Frankel teaches, discloses, or suggests "maximizing a product of a transmission distance and a transmission capacity of the system," or "wherein the type of modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claim 1. Koshi does not either, and thus cannot make up for the deficiencies of either Bigo, Miyamoto, or Frankel with respect to claim 15. Thus, even if Bigo, Miyamoto, Frankel, and Koshi were combined as proposed in the final Office Action, claim 15 would not result. Claim 15 is thus also submitted to be allowable. Withdrawal of the rejection of claim 15 is earnestly solicited.

Claims 16 and 25:

Claims 16 and 25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bigo and Miyamoto in view of U.S. Patent No. 6,690,886 to Guy (hereinafter "Guy"). The rejection is traversed. Reconsideration is earnestly solicited.

Claim 16 depends from claim 1 and adds additional distinguishing elements. Neither Bigo nor Miyamoto teaches, discloses, or suggests "maximizing a product of a transmission distance and a transmission capacity of the system," or "wherein the type of modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claim 1. Guy does not either, and thus cannot make up for the deficiencies of either Bigo or Miyamoto with respect to claim 16. Thus, even if Bigo, Miyamoto, and Guy were combined as proposed in

the final Office Action, claim 16 would not result. Claim 16 is thus also submitted to be allowable. Withdrawal of the rejection of claim 16 is earnestly solicited.

Claim 25:

Claim 25 recites:

Wherein the type of modulation of said signal light is an NRZ modulation type.

Neither Bigo nor Miyamoto teaches, discloses, or suggests "wherein the type of modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claim 1. Guy does not either, and thus cannot make up for the deficiencies of either Bigo or Miyamoto with respect to claim 25. Thus, even if Bigo, Miyamoto, and Guy were combined as proposed in the final Office Action, claim 25 would not result.

Claim 25 recites:

$$T(f) = 10 \cdot \log \left[ \exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left( \frac{|f - fc|}{\Delta f/2} \right)^{2n} \right\} \right] \quad (\text{dB})$$

neither Bigo nor Miyamoto teaches, discloses, or suggests

$$"T(f) = 10 \cdot \log \left[ \exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left( \frac{|f - fc|}{\Delta f/2} \right)^{2n} \right\} \right] \quad (\text{dB}),"$$

as discussed above with respect to the rejection of claim 1. Thus, even if Bigo and Miyamoto were combined as proposed in the final Office Action, claim 25 would not result. Claim 25 is thus also submitted to be allowable. Withdrawal of the rejection of claim 25 is earnestly solicited.

Claims 18, 20, and 22:

Claims 18, 20, and 22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bigo and Miyamoto in view of U.S. Patent No. 7,035,044 to Silverberg et al. (hereinafter "Silverberg"). The rejection is traversed. Reconsideration is earnestly solicited.

Claims 18, 20, and 22 recite:

Wherein the type of modulation of said signal light is an NRZ modulation type.

Neither Bigo nor Miyamoto teaches, discloses, or suggests "wherein the type of modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claim 1. Silverberg does not either, and thus cannot make up for the deficiencies



of either Bigo or Miyamoto with respect to claims 18, 20, and 22. Thus, even if Bigo, Miyamoto, and Silverberg were combined as proposed in the final Office Action, claims 18, 20, and 22 would not result.

Claims 18, 20, and 22 recite:

$$T(f) = 10 \cdot \log \left[ \exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left( \frac{|f - f_c|}{\Delta f / 2} \right)^{2n} \right\} \right] \quad (\text{dB})$$

neither Bigo nor Miyamoto teaches, discloses, or suggests

$$"T(f) = 10 \cdot \log \left[ \exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left( \frac{|f - f_c|}{\Delta f / 2} \right)^{2n} \right\} \right] \quad (\text{dB}),"$$

as discussed above with respect to the

rejection of claim 1. Thus, even if Bigo and Miyamoto were combined as proposed in the final Office Action, claims 18, 20, and 22 would not result. Claims 18, 20, and 22 are thus also submitted to be allowable. Withdrawal of the rejection of claims 18, 20, and 22 is earnestly solicited.

### **Conclusion:**

Accordingly, in view of the reasons given above, it is submitted that all of claims 1, 3-18, 20, 22, and 25 are allowable over the cited references. Allowance of all claims 1, 3-18, 20, 22, and 25 and of this entire application is therefore respectfully requested.

Finally, if there are any formal matters remaining after this response, the Examiner is invited to telephone the undersigned to attend to these matters.

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If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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